

REMARKS

Claims 1, 3-13, 15-26, 28-34 and 36-38 are currently pending. Claims 1, 3-5, 7, 9, 13, 15-16, 19, 21-22, 25-26, 28-33 and 37-38 are amended. Applicants request reconsideration of claims 1, 3-13, 15-26, 28-34 and 36-38 in view of the above amendments and the following remarks.

Claim Rejection – 35 USC § 101

The Office has rejected claims 25-26 and 28-31 under 35 U.S.C 101 because the claimed invention is directed to non-statutory subject matter. Applicants have amended claim 25 to direct to an apparatus for compiling a high-level programming language into an object code. The apparatus of claim 25 provides a practical application when the high-level programming language is transformed into an object code. The object code is a useful, concrete and tangible result as it can be executed in a machine to provide a function.

Applicants respectfully request the Office to withdraw the rejection of claim 25 as the apparatus of claim 25 constitutes a statutory category of patentable subject matter. Applicants also request the Office to withdraw the rejection of claims 26 and 28-31 as they are dependent on claim 25 and therefore constitute a statutory category of patentable subject matter.

Claim Rejection – 35 USC § 102

The Office Action has rejected claims 1-3, 5, 12-13, 15, 17, 24-26, 28-30, 32-34, and 36-38 under 35 U.S.C. § 102(c), as being anticipated by U.S. Patent No 7,007,271 issued to Kumar et al. (hereinafter referred to as “*Kumar*”).

According to MPEP §2131,

“‘A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference.’ (Verdegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987)). ‘The identical invention must be shown in as complete detail as is contained in the ... claim.’ (Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989)). ‘The elements must be arranged as required by the claim, but this is not an ipsissimis verbis test, i.e., identity of terminology is not required.’ (In re Bond, 910 F.2d 831, 15 USPQ2d 1566 (Fed. Cir. 1990)).”

Claim 1, as amended herein, recites the following:

1. A method comprising:

determining a new slack value based on current resource constraints, for each of one or more ready instructions in a scheduling region;

selecting one of the ready instructions, based on the new slack value of the one ready instruction;

scheduling the selected ready instruction; and

repeating the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled.

(Emphasis added)

The emphasized limitations of claim 1 recites a method to determine a new slack value based on current resource constraints, for each of one or more ready instructions in a scheduling region, and to repeat the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled.

As described in paragraphs 82-114, figures 2-4 and 6-10 of the specification, after

a ready instruction is scheduled, the deadline value and slack value of each ready instruction remaining to be selected and scheduled is re-computed in one embodiment of the invention. In particular, figure 9 shows that after the ready instruction is scheduled (step 912), all the possible paths of the flow involves re-computing the ready list (path from step 912 to step 905 and to step 914 and path from step 912 to step 905 and to step 910). Figure 10 shows that re-computing the ready list requires re-computing the deadline value and slack value of each instruction remaining to be selected and scheduled (step 1010).

The re-computing is required in one embodiment of the invention because the deadline value and slack value of the each remaining ready instruction is subject to change after other instructions have been scheduled. The deadline value and slack value of each remaining ready instruction may change when a particular ready instruction is scheduled because that particular ready instruction takes up one unit of resource for its execution. Since one unit of resource is taken by that particular ready instruction, the deadline value and slack of each remaining ready instruction may be affected as the scheduling region has one unit of resource lesser to be allocated. Therefore, it is important to repeat the step of determining the slack value based on current resource constraints to factor the resource taken when a ready instruction is scheduled, for each of the ready instructions remaining to be selected and scheduled.

The Office has cited that in page 13 of the Office Action:

“... There is no clear implementation details in the claimed step of ‘repeating’ in terms of ‘until all ready instructions have been scheduled’ that particularly impose the requirement that for each instruction, there is a first computing then there is a re-computing at a latter stage of iteration...”

Applicants respectfully disagree with the Office. The first limitation of claim 1 recites

determining a new slack value based on current resource constraints for each of one or more ready instructions in a scheduling region, i.e., a first computing of the new slack value for each of one or more ready instructions in a scheduling region. The fourth limitation of claim 1 recites repeating the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled. The fourth limitation of claim 1 clearly recites repeating the method for determining the slack value based on the current resource constraints for each of one or more ready instructions in the scheduling region, i.e., a second computing of the slack value in the first iteration of the method of claim 1, until all ready instructions have been scheduled.

The fourth limitation of claim 1 does not contain any condition that limits repeating the method of determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled execution of the repetition. Since there is no condition required to determine whether the step of repeating the method of determining, selecting and scheduling is or is not to be performed, the repetition happens for each of one or more ready instructions. Therefore, Applicants disagree with the Office and submits that the fourth limitation of claim 1 does contain clear implementation details that particularly impose the requirement that for each instruction, there is a first computing then there is a re-computing at a latter stage of iteration.

Kumar merely describes a method of integrated instruction scheduling and register allocation. ***Kumar* does not teach, and in fact, teaches away from the limitation in claim 1 of repeating the method for determining, selecting and**

scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled. In step 115 of figure 1, *Kumar* shows that the priority function for instructions in the selected region is computed only once. *Kumar* further describes that one factor for determining the priority function is slack, where column 14, lines 21-24, states ... *An instruction that has certain predetermined number of 'slacks' can have predetermined priority...*” **None of the subsequent steps after step 115 involves re-computing of the priority function (slack value) based on the current resource constraints.**

In contrast, claim 1 recites repeating the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled. As discussed earlier, it is important to reconsider the current resource constraints after each iteration of the method for determining, selecting and scheduling as the deadline value and slack value of the each instruction remaining to be selected and scheduled is subject to change after other ready instructions have been scheduled. *Kumar* fails to consider re-computing of the slack value of the remaining instructions after an instruction is scheduled.

The Office has asserted in page 14, lines 2-9, the following:

“...upon determining that entire process is not done (step 135), a backward branch ... restart the loop at step 105...reach a point where a computation is done for instructions inside a selected region (compute priority function – step 115); and for all instruction in this region, the scheduling is effectuated based upon all the pertinent constraints (based on that compute step) and updating of priority functions; such that once all instructions of such selected region have been addressed (step 120), the algorithm takes the cycle back to step 125 to reach step 135 for another iteration operation on until all selected regions are scheduled...”

Applicant respectfully points out to the Office that *Kumar* describes scheduling of instructions only in step 165 of figure 1. The assertion by the Office that the scheduling of instructions is effectuated based upon all the pertinent constraints (based on compute step) and updating of priority functions is not supported by *Kumar*'s disclosure. *Kumar* describes that the step 115 of computing the priority function can be determined using various interacting factors individually or in combination (col. 14, lines 15-31) *Kumar* does not describe that when computing the priority function is complete (step 115) and when the priority function is updated, the scheduling is effectuated. In fact, computing the priority function (step 115) merely allows the selection of an instruction based on the priority function in step 155 so that the instruction can further be scheduled in step 165.

Applicants fail to see the reasoning for the Office's assertion that the scheduling of instructions is effectuated based upon all the pertinent constraints (based on compute step) and updating of priority functions and requests clarification from the Office for the assertion.

Therefore, since *Kumar* fails to teach at least one element in claim 1, Applicants respectfully request the Office to withdraw the rejection of claim 1. Independent claims 13, 25 and 32 similarly recite the same limitation in claim 1. All the arguments presented earlier for claim 1 apply fully to claims 13, 25 and 32. Therefore dependent claims 2-3, 5, 12, 15, 17, 24, 26, 28-30, 33-34, and 36-38 are patentable as being dependent on the allowable base claims. (MPEP2143.03)

Claim Rejections – 35 USC § 103

The Office Action has rejected claims 4, 9-11, 16, 21-23 and 31 under 35 U.S.C 103(a), as being unpatentable over *Kumar*.

In order to establish *prima facie* case of obviousness, the Supreme Court in *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1395-97 (2007) identified a number of rationales to support a conclusion of obviousness which are consistent with the proper "functional approach" to the determination of obviousness as laid down in *Graham*. One of the rationales includes combining prior art elements according to known methods to yield predictable results. To reject a claim based on this rationale, Office personnel must resolve the *Graham* factual inquiries. Then, Office personnel must articulate the following:

(1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference;

(2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely performs the same function as it does separately;

(3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and

(4) whatever additional findings based on the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

As discussed earlier, *Kumar* does not teach or suggest the limitation in claim 1 of repeating the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled. Therefore, there is no *prima facie* case of obviousness as *Kumar* fails to teach at least one element of the limitation in claim 1, as stated in

Graham factual inquiries. Applicant respectfully requests the withdrawal of the rejection of claim 1.

Independent claims 13 and 25 similarly recite the same limitation in claim 1. All the arguments presented earlier for claim 1 apply fully to claims 13 and 25. Therefore dependent claims 4, 9-11, 16, 21-23 and 31 are patentable as being dependent on the allowable base claims. (MPEP2143.03)

Claim Rejections – 35 USC § 103

The Office Action has rejected claims 6-8, and 18-20 under 35 U.S.C 103(a), as being unpatentable over *Kumar*, in view of Cooper et al, ‘An Experimental Evaluation of List Scheduling’, Rice University, pp 1-15, September 1998. (hereinafter referred to as “*Cooper*”).

As discussed earlier, *Kumar* does not teach or suggest the limitation in claim 1 of repeating the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled.

Cooper describes an evaluation of list scheduling. *Cooper* does not teach or suggest the limitation in claim 1 of repeating the method for determining, selecting and scheduling for each of the one or more ready instructions remaining to be selected and scheduled until all ready instructions have been scheduled.

Therefore, there is no *prima facie* case of obviousness as both *Kumar* and *Cooper* fail to teach at least one element of the limitation in claim 1, as stated in Graham factual inquiries. Applicant respectfully requests the withdrawal of the rejection of claim 1.

Independent claims 13 and 25 similarly recite the same limitation in claim 1. All the arguments presented earlier for claim 1 apply fully to claims 13 and 25. Therefore dependent claims 6-8, and 18-20 are patentable as being dependent on the allowable base claims. (MPEP2143.03)

Conclusion

Applicants respectfully submit that the rejections have been overcome by the amendment and remark, and that the claims as amended are now in condition for allowance. Accordingly, Applicants respectfully request the rejections be withdrawn and the claims as amended be allowed.

Invitation for a Telephone Interview

The Examiner is requested to call the undersigned at (503) 439-8778 if there remains any issue with allowance of the case.

Request for an Extension of Time

The Applicant respectfully petitions for extension of time to respond to the outstanding Office Action pursuant to 37 C.F.R. § 1.136(a) should one be needed. Please charge the fee under 37 C.F.R. § 1.17 for such extension to our Deposit Account No. 02-2666.

Charge our Deposit Account

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Date: September 29, 2008

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